CLAIMS

What is claimed is:

1. A method for obtaining hydrogen, comprising:

passing a fuel gas stream over an anode to create an anode effluent stream; and

obtaining a hydrogen gas stream from at least a portion of the anode effluent stream.

2. The method according to claim 1 wherein the hydrogen gas stream is obtained using a hydrogen membrane.

3. The method according to claim 1 wherein the anode comprises part of a first fuel cell stack.

4. The method according to claim 3 wherein the fuel cell stack comprises a dual chamber stack.

5. The method according to claim 3 wherein the fuel cell stack comprises a single chamber stack.

6. The method according to claim 3 further comprising:

storing the hydrogen gas stream in a hydrogen storage device.

7. The method according to claim 6 wherein the hydrogen storage device comprises a metal hydride bed.

8. The method according to claim 6 further comprising:

passing the stored hydrogen from the integrated storage device over the anode during start-up of the first fuel cell stack.

9. The method according to claim 6 further comprising:
passing the stored hydrogen from the integrated storage device over a second anode during start-up of a fuel cell stack.

10. The method according to claim 9 wherein the second anode is either (i) a second anode in the first fuel cell stack or (ii) an anode in a second fuel cell stack.

11. The method according to claim 1 further comprising;
a heating step for heating the fuel gas stream prior to being passed over the anode.

12. The method according to claim 1 further comprising:
passing at least a portion of the fuel gas stream through a temperature control unit prior to being passed over the anode.

13. The method according to claim 13 wherein the temperature control unit is a heat exchanger.

14. The method according to claim 12 wherein heat is at least partially provided by passing at least a portion of the anode effluent through the temperature control unit.

15. A method for operating a fuel cell, comprising:
passing hydrogen from an integrated storage unit over an anode during start-up; and
replenishing the stored hydrogen by passing a hydrogen gas stream into the storage unit;
wherein the hydrogen gas stream is obtained from an anode effluent stream.

16. The method according to claim 15 wherein the hydrogen storage unit comprises a metal hydride bed.

17. The method according to claim 15 wherein the hydrogen gas stream is obtained using a hydrogen generation unit.

18. The method according to claim 17 wherein the hydrogen generation unit comprises a hydrogen membrane.

19. The method according to claim 15 further comprising passing at least a portion of the anode effluent through a temperature control unit.

20. A method for heating a fuel cell, comprising:
passing an oxygen containing gas over an active material in a hydrogen storage unit to create an exothermic reaction heat source; and
conveying the heat from the exothermic reaction to the fuel cell.

21. The method according to claim 20 wherein the active material comprises metal hydride material.

22. The method according to claim 20 wherein the active material comprises a metal selected from the group consisting of Pd, Pt, Ru, Rh and Ni.

23. The method according to claim 20 wherein the active material comprises Pd.

24. The method according to claim 20 wherein the active material comprises a hydrogen oxidation catalyst.

25. The method according to claim 20 further comprising;

passing at least a portion of the oxygen containing gas through a temperature control unit.

26. The method according to claim 25 wherein the temperature control unit is a heat exchanger.

27. A fuel cell system, comprising:
a fuel cell stack; and
a hydrogen storage unit; and
a hydrogen generation unit configured to produce a hydrogen gas stream from an anode effluent stream.

28. The system according to claim 27 wherein the hydrogen storage unit comprises one or more mechanisms selected from the group consisting of metal hydride bed, hydrogen sorption material, and compressed gas bottle.

29. The system according to claim 27 wherein the hydrogen storage unit comprises a metal hydride.

30. The system according to claim 27 wherein the hydrogen generation unit comprises a hydrogen separation membrane.

31. The system according to claim 27 further comprising a temperature control unit.

32. The system according to claim 31 wherein the temperature control unit is a heat exchanger.

33. The system according to claim 27 further comprising:
a heating means for speeding up fuel cell startup.

34. The system according to claim 27 further comprising:

a hydrogen means for providing additional power during high load on the fuel cell stack.

35. The system according to claim 27 further comprising:

a hydrogen means for recycling hydrogen through the fuel cell stack to be used for rapid startup.

36. A fuel cell system, comprising:

a fuel cell stack; and

a means for storing hydrogen; and

a means for obtaining hydrogen from an anode effluent stream.

37. The system according to claim 36 wherein the means for hydrogen storage comprises a metal hydride.

38. The system according to claim 36 wherein the means for obtaining hydrogen comprises hydrogen separation membrane.

39. The system according to claim 36 further comprising:

a means for heating any fuel cell gas feed streams.

40. The system according to claim 36 further comprising a temperature control unit.

41. The system according to claim 36 wherein the temperature control unit is a heat exchanger.

42. The system according to claim 36 further comprising:

a heating means for speeding up fuel cell startup.

43. The system according to claim 36 further comprising:

a hydrogen means for providing additional power during high load on the fuel cell stack.

44. The system according to claim 36 further comprising:

a hydrogen means for recycling hydrogen through the fuel cell stack to be used for rapid startup.